UNIVERSITÀ
POLITECNICA
DELLE MARCHE

Supervisor: Prof. Andrea Bonci

Dept. of Information Engineering (DII)

UNIVERSITÀ POLITECNICA DELLE MARCHE

Supervisor: Prof. ANDREA BONCI, PhD, MS, Eng.

Activities

Andrea Bonci: Associate Professor in **Control and Automation Engineering**
@UNIVPM - DII: Dept. of Information Engineering.
Head of **Automation Laboratory**, a facility based in the Faculty of Engineering, Marche Polytechnic University, Ancona, Italy

Research area

Control systems engineering and theory for **intelligent autonomous systems**, spanning robotic platforms such as self-driving vehicles, mobile and industrial robots, drones, and related agents capable of **trustworthy, safety-critical, reliable autonomy** in complex, real-world environments. The research focuses on advanced **control and optimization** integrated with **AI, sensor fusion,** and **robust localization and navigation**, addressing the **open challenge of real-time decision-making under uncertainty with safety guarantees**, with an emphasis on **real-time, deployable embedded-ready** solutions. Representative applications include guidance and navigation algorithms for driverless mobility and transportation; **autonomous robotic** solutions **for circular manufacturing**, including automated disassembly in apparel and fashion; **machine diagnosis** and **predictive maintenance**; and monitoring, control, and optimization of factory production and supply chains within Industry 4.0 and 5.0. Additional work targets **AI-based** recognition, prediction, and analysis pipelines on **resource-constrained embedded devices**, as well as inspection and optimization systems for **industrial packaging machines**.

SUN RISE SMALLER (STRATEGIC) UNIVERSITIES NETWORK FOR REGIONAL INNOVATIVE AND SUSTAINABLE EVOLUTION

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Description

Funded projects

EU fundings:

- 2026-2030: **DETROID "Dependable Software-Defined Vehicles with Resilient Powertrain and Chassis Dynamics"** Horizon **MSCA-SE** (Marie Skłodowska-Curie Actions – Staff Exchanges)
Call HORIZON-MSCA-2025-SE-01; Topic HORIZON-MSCA-2025-SE-01-01, G.A. 101299877
- 2023-2026: **EDIH4Marche "European Digital Innovation Hub for Marche"**, **Horizon Europe Digital** G.A. 101084027. It supports companies through digital innovation in the context of Industry 4.0 and in implementing company's digital strategy.
- 2019-2022: **ENCORE "ENergy aware BIM cloud Platform in a Cost-effective Building REnovation Context"**, **H2020** G.A. 820434. increase the share of renovated stock in Europe and worldwide by providing effective and affordable BIM tools that cover the whole renovation life-cycle (from data collection to project execution, and commissioning/delivery).

National fundings (selected)**:**

- 2023-2026: "**CIRCULAR FASHION** - robotic disassembly for circular fashion and digital solutions for eco-design of apparel and fashion products" funded by INVITALIA and Italian Ministry of Economic Development (MISE).
- 2024-2025: "**Edge4PdM** - Edge computing for Predictive Maintenance and diagnosis of machine driven by an electric motor", Proof of Concept VALUE (VALUing the outcomes of the UnivErsity research), Italian PNRR.
- 2023-2026: "**Perseo** - enhancement of the GUCCI Logistic S.p.A. and PIGINI S.r.l. production capacity of footwear articles, through technological development of new production methods and machinery" funded by Italian Ministry of Industry and Made in Italy (MIMIT).
- 2020-2024: "**Electrospindle 4.0 Zero Defect Manufacturing**" funded by Italian Ministry of Economic Development (MISE).
- 2019-2022: "**ARTES 4.0**-Advanced Robotics and enabling digital TEchnologies & Systems 4.0" National Competence Center on Industry 4.0, funded by Italian Ministry of Economic Development (MISE).

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Key roles and **international recognition** (selected)

- **Evaluator of EU projects** for **MSCA Postdoctoral Fellowships** calls for proposals under the Marie Skłodowska-Curie Actions: HORIZON-MSCA-2025-PF, HORIZON-MSCA-2024-PF-01, HORIZON-MSCA-2023-PF-01,
- **Evaluator of EU projects** for **EIC Transition Advanced innovation Challenge** (AIC): HORIZON-EIC-2026-AIC.
- **Board of experts** for **DG CNECT studies on EU critical digital technologies**, contributing to the EU strategic roadmap for emerging and critical digital capabilities (2028–2040).
- **Associate Editor / Editorial Board Member** of the international journals: **Control Engineering Practice** (Elsevier); **Electronics** (Switzerland).
- **IEEE Senior Member**;
- **Member of IEEE IES** (Industrial Electronics Society) **Technical Committees**: **Factory Automation** (TCFA), **Responsible AI** (TC-RAI), **Industrial Agents** (TCIA).
- Member**, IEEE IES Standards Working Group P2660.1**.
- **Chair,** Special Sessions at **IEEE ETFA** (Int. Conf. on Emerging Technologies and Factory Automation) 2024-2026.
- **Plenary Speaker**, MEMM2023 – 30th conference on Materials Engineering and Modern Manufacturing 2023.
- **Guest Professor**, Rzeszow University of Technology, Poland (May 2023/Academic teaching period).
- **Invited Speaker** at 13th and 9th Conference Lean Learning Academy, Rzeszow University of Technology, Poland (May 2023, 2021)
- **Invited Speaker at International PhD Summer Schools** on: Industrial Agents (Engineering of Cyber Physical Production Systems) ISSIA2020, and Computing in Construction (CCSS2019)

Awards (selected)

- Awarded as "**Outstanding Associate Editor**" of the journal **Control Engineering Practice** (2025)
- Winner of the program **"VALUE - Valuing the outcomes of university research"** (2024)
- **Best Presentation Award** for the paper "The overall labour effectiveness to improve competitiveness and productivity in human-centered manufacturing", International Scientific Technical Conference, 16-19 May.2022, Poznan, Poland.

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Mentorship activities

- **Fixed-term assistant professor** supervisor and scientific tutor: n. 3
- **PhD student** supervisor: n. 9
- **Research Fellows** (**Post-Doc** positions) supervisor**:** n. 10
- **Fixed-term contracts** tutor: n.3
- **Master's degree theses** supervisor**:** n. 40
- **Bachelor's degree theses** supervisor: n. 60

- Member of selection **committees for admission to PhD fellowship**: n.2
- Member of **doctoral examination committees**: n. 3

Patent activity

Inventor of patents - n.4

- Method and system for diagnosing faults in a machine driven by an electric motor
- Optimal control system for vibratory feeder
- Fast dynamic weighing system
- Gripping system for high-precision machining

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Description

ORCID and **Indicators**

- **ORCID-id**: https://orcid.org/0000-0003-0265-1598
- **H-index:** 23 according to Google Scholar, 19 according to Scopus

Publications (selected)

- **Author** or co-author of more than **110 peer-reviewed research papers** in international journals and conferences.
- The publications **cover over 20 years of activity in the fields** of control engineering, robotics, autonomous vehicles and systems, vehicles dynamics, optimization, nonlinear systems, AI and ML, industrial automation, robotic disassembly, embedded systems, cyber-physical-systems, diagnosis and maintenance, multisensory fusion.
- A **Brief list** of **selected publications**:

1) A. Bonci, F. Brunella, M. Colletta, A. Di Biase, A. F. Dragoni, A. Libofsha “ROS 2-Based Architecture for Autonomous Driving Systems: Design and Implementation” Sensors - MDPI (Switzerland), 26 (2), pp. 1-29, Jan. 2026.
2) R. Kermenov, S. Foix, J. Borràs, V. Castorani, S. Longhi, A. Bonci, “Automating the hand layup process: On the removal of protective films with collaborative robots”, Robotics and Computer-Integrated Manufacturing, Elsevier, Vol. 93, 102899, pp 1-10, June 2025.
3) A. Bonci, F. Brunella, M. Colletta, A. Di Biase, A. F. Dragoni, A. Libofsha "Hierarchical Graph Search for Multi-Goal Route Planning in Autonomous Driving", 2025 IEEE 30th International Conference on Emerging Technologies and Factory Automation (ETFA2025), pp. 1-6, Porto, Portugal, 9-12 Sept. 2025.
4) A. Bonci, S. Longhi, G. Nabissi and G. A. Scala. “Execution Time of Optimal Controls in Hard Real Time, a Minimal Execution Time Solution for Nonlinear SDRE”, IEEE Access, Vol. 8, Issue 1, pp. 158008-158025, Aug. 27, 2020.
5) A. Bonci, S. Longhi, and G. A. Scala. “Towards an All-Wheel Drive Motorcycle: Dynamic Modeling and Simulation”, IEEE Access, Vol. 8, Issue 1, pp. 112867-112882, June 2020.
6) A. Bonci, M. Pirani, and S. Longhi. “Tiny Cyber-Physical Systems for Performance Improvement in the Factory of the Future”, IEEE Transactions on Industrial Informatics, Vol. 15, Issue 3, pp. 1598-1608, March 2019.

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Staff, equipment and laboratories

Laboratories

Automation Lab

https://dii.univpm.it/en-gb/aut_en/

Staff:

The group currently consists of:
an **associate professor**,
a **researcher**,
a **research fellows**,
a **technician**,
a **PhD student,** and
three master students.

Equipment:

Industrial **Collaborative Robot Omron TM5**, Industrial **Mobile robot MIR 200** equipped with **Collaborative Robot UR5**, **Robot gripping tool set**, **1/10 scale vehicles** equipped with **autonomous driving systems**, **Autonomous e-byke**, **Drones, UAVs and UGVs,** CP-Factory **real scale production line**, Industrial **weighing and vibratory machines**, **Test bench** for electric motors diagnosis and testing, Embedded **microcontroller boards**, **Lab instrumentation** as Oscilloscopes, Power supplies, Signal generators, etc.

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Project idea

Indicative Research Directions for MSCA-PF Candidates

We welcome MSCA-PF candidates interested in advancing **trustworthy, safety-critical autonomy** for **intelligent autonomous systems**, with **robust operation under real-world sensing limitations**.

The hosting group works at the intersection of **control and optimization, AI, sensor fusion, and robust localization/navigation**, tackling **real-time decision-making under uncertainty with safety guarantees**, and prioritizing **deployable, embedded-ready** solutions.

Key directions include **perception/fusion under sensor degradation** (occlusions, drift, etc.) and the **systematic use of uncertainty in control and planning** (e.g., constraint, risk-aware motion planning), enabling **edge real-time deployment** and rigorous evaluation. Candidates may also pursue **interpretable model learning**, using **symbolic regression** to derive compact, physically meaningful models that support monitoring, diagnosis, online adaptation, and model-based control.

Application domains span autonomous vehicles/mobile robots, industrial robotics (including circular manufacturing/disassembly), and industrial inspection/optimization; **complementary expertise** (e.g., edge AI, formal verification, learning-enabled control, advanced perception, HRI/shared autonomy) is welcome with a clear path to real-time implementation and experimental validation.

We **encourage candidates** to bring **their own original ideas and/or complementary expertise to shape** a **high-impact project** within these directions, delivering both scientific advances and validated real-time prototypes.

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